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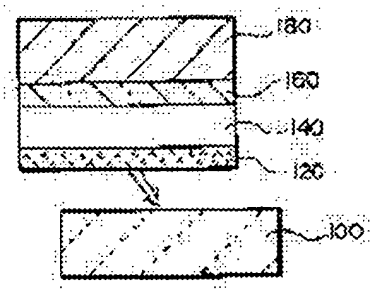
(54) TRANSFER OF THIN FILM ELEMENT, THIN FILM ELEMENT, THIN FILM INTEGRATED CIRCUIT DEVICE, ACTIVE MATERIX SUBSTRATE AND LIQUID CRYSTAL DISPLAY DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To make it possible to select a substrate, which is used at the time of the manufacture of a thin film element, and a substrate (a substrate having a desirable nature as seen from the use of a product), which is used at the time of the actual use of a product, for example, independently and freely.

SOLUTION: An isolation layer 120 is kept provided on a substrate 100, which is high in reliability and can transmit a laser beam, and a thin film element 140, such as a TFT, is formed on the substrate 1. A laser beam is irradiated from the side of the substrate 100 to the layer 120, whereby a separation is generated in the layer 120. The element 140 is bonded to a transfer material 180 via an adhesiveness layer 160 and the substrate 100 is



made to separate from the layer 120. Thereby, a desirable thin film device can be transferred even to any substrate.

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CLAIMS

[Claim(s)]
[Claim 1] The process which is the approach of imprinting the thin film on a substrate on an imprint object, and forms a detached core on said substrate, The process which forms the transferred layer containing a thin film on said detached core, and the process which joins the transferred layer containing said thin film to said imprint object through a glue line, The imprint approach of the thin film characterized by having the process which irradiates light at said detached core, and produces and cheats out of exfoliation in the inside of the layer of said detached core, and/or an interface, and the process which makes said substrate secede from said detached core.
[Claim 2] It is the imprint approach of the thin film characterized by for said substrate being a substrate of translucency and performing the exposure of said light to said detached core through the substrate of said translucency in claim 1.
[Claim 3] The imprint approach of the thin film characterized by having further the process which removes said detached core adhering to said imprint object in claim 1 or claim 2.
[Claim 4] It is the imprint approach of the thin film characterized by said imprint object being a transparence substrate in either claim 1 - claim 3.
[Claim 5] It is the imprint approach of the thin film characterized by a glass transition point (Tg) or softening temperature consisting of ingredients below said Tmax when said imprint object sets the maximum temperature in the case of formation of a transferred layer to Tmax in either claim 1 - claim 4.

[Claim 6] Said imprint object is the imprint approach of a thin film that a glass transition point (Tg) or softening temperature is characterized by being below the maximum temperature of the formation process of said thin film in either claim 1 - claim 4.
[Claim 7] It is the imprint approach of the thin film characterized by said imprint object consisting of synthetic resin or glass material in either claim 1 - claim 6.
[Claim 8] It is the imprint approach of the thin film characterized by said substrate having thermal resistance in either claim 1 - claim 7.
[Claim 9] It is the imprint approach of the thin film characterized by being the substrate with which said substrate penetrates 310nm light 10% or more in either claim 1 - claim 8.
[Claim 10] It is the imprint approach of the thin film characterized by the point [distortion] consisting of ingredients more than said Tmax when said substrate sets the maximum temperature in the case of formation of a transferred layer to Tmax in claim 1 - claim 9.
[Claim 11] It is the imprint approach of the thin film characterized by said detached core consisting of amorphous silicons in either claim 1 - claim 10.
[Claim 12] It is the imprint approach of the thin film characterized by said amorphous silicon containing hydrogen (H) more than 2 atom % in claim 11.
[Claim 13] It is the imprint approach of the thin film characterized by said amorphous silicon containing hydrogen (H) more than 10 atom % in claim 12.
[Claim 14] The imprint approach of the thin film characterized by said detached core consisting of

silicon nitride in either claim 1 - claim 10.
[Claim 15] The imprint approach of the thin film characterized by said detached core consisting of a hydrogen content alloy in either claim 1 - claim 10.
[Claim 16] The imprint approach of the thin film characterized by said detached core consisting of a nitrogen content metal alloy in either claim 1 - claim 10.
[Claim 17] It is the imprint approach of the thin film characterized by said detached core consisting of multilayers in either claim 1 - claim 10.
[Claim 18] It is the imprint approach of the thin film characterized by consisting of a metal membrane by which said multilayers were formed the amorphous silicon film and on it in claim 17.
[Claim 19] It is the imprint approach of a thin film that said detached core is characterized by the thing of the ceramics, a metal, and organic polymeric materials which consists of kinds at least in either claim 1 - claim 10.
[Claim 20] It is the imprint approach of the thin film characterized by said light being laser light in either claim 1 - claim 19.
[Claim 21] The imprint approach of a thin film that wavelength of said laser light is characterized by being 100nm - 350nm in claim 20.
[Claim 22] The imprint approach of a thin film that wavelength of said laser light is characterized by being 350nm - 1200nm in claim 20.
[Claim 23] It is the imprint approach of the thin film characterized by said thin film being a thin film transistor (TFT) in either claim 1 - claim 22.
[Claim 24] The imprint approach of the thin film which carries out multiple-times activation of the imprint approach according to claim 1, and is characterized by imprinting two or more transferred layers on said larger imprint object than said substrate in either claim 1 - claim 23.
[Claim 25] The imprint approach of the thin film which carries out multiple-times activation of the imprint approach according to claim 1, and is characterized by imprinting two or more transferred layers from which the level of the design Ruhr of a thin film differs on said imprint object in either claim 1 - claim 24.
[Claim 26] The thin film which said imprint object comes to imprint using the imprint approach according to claim 1 to 22.
[Claim 27] It is the thin film characterized by said thin film being a thin film transistor (TFT) in claim 26.
[Claim 28] Thin film integrated circuit equipment constituted including the thin film imprinted by said imprint object using the imprint approach according to claim 1 to 25.
[Claim 29] The active-matrix substrate which is a active-matrix substrate with which the pixel section is constituted including the thin film transistor (TFT) arranged in the shape of a matrix, and the pixel electrode connected to the end of the thin film transistor, and was manufactured by imprinting the thin film transistor of said pixel section using an approach according to claim 1 to 24.
[Claim 30] The thin film transistor connected to the scanning line arranged in the shape of a matrix, and a signal line (TFT), The pixel section is constituted including the pixel electrode connected to the end of the thin film transistor. And it is the active-matrix substrate which contains the driver circuit for supplying a signal in said scanning line and said signal line. The active-matrix substrate possessing the thin film transistor which constitutes the thin film transistor of said pixel section of the 1st design Ruhr level formed using the approach according to claim 25, and said driver circuit of the 2nd design Ruhr level.
[Claim 31] The liquid crystal display manufactured using the active-matrix substrate according to claim 29 to 30.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the imprint approach, the thin film, the thin film integrated circuit equipment, active-matrix substrate, and liquid crystal display of a thin film.
[0002]
[Background of the Invention] For example, it faces manufacturing the liquid crystal display using a thin film transistor (TFT), and passes through the process which forms a thin film transistor by CVD etc. on a substrate. Since the process which forms a thin film transistor on a substrate is accompanied by high temperature processing, a substrate needs to use what has the high thing, i.e., the softening temperature, and the high melting point of the quality of the material which is excellent in thermal resistance. Therefore, in current, quartz glass is used as a substrate which bears the temperature of about 1000 degrees C, and heat-resisting glass is used as a substrate which bears the temperature around 500 degrees C.
[0003]
[Problem(s) to be Solved by the Invention] As mentioned above, the substrate in which a thin film is carried must satisfy the conditions for manufacturing those thin films. That is, it is determined that the substrate to be used will surely fulfill the manufacture conditions of the device carried.
[0004] However, when its attention is paid only to the phase after the substrate in which thin films, such as TFT, were carried is completed, above-mentioned "substrate" is not sometimes necessarily desirable.
[0005] For example, although a quartz substrate, a heat-resisting glass substrate, etc. are used as mentioned above when passing through the manufacture process accompanied by high temperature processing, these are very expensive, therefore cause the rise of a product price.
[0006] Moreover, a glass substrate has the property for it to be heavy and to be easy to be divided. Although what cannot break easily even if it is cheap as much as possible, it is light and it bears and drops also on deformation of some with the liquid crystal display used for portable electronic devices, such as a palmtop computer and a portable telephone, is desirable, actually, a glass substrate is heavy, and is weak to deformation, and it is common that there is fear of destruction by fall.
[0007] That is, it was very difficult for a slot to be between the desirable properties required of the constraint which comes from manufacture conditions, and a product, and to satisfy the conditions and property of these both sides to it.
[0008] This invention is made paying attention to such a trouble, and one of the purpose of the is to offer the new technique which makes it possible to choose independently freely the substrate used at the time of manufacture of a thin film, and the substrate (substrate with a property desirable in view of the application of a product) used at the time of real use of a product.
[0009]
[Means for Solving the Problem] This invention which solves the technical problem mentioned above is carrying out the following configurations.
[0010] (1) The process which this invention according to claim 1 is the approach of imprinting the thin

film on a substrate on an imprint object, and forms a detached core on said substrate, The process which forms the transferred layer containing a thin film on said detached core, and the process which joins the transferred layer containing said thin film to said imprint object through a glue line, Light is irradiated at said detached core and it is characterized by having the process which produces and cheats out of exfoliation in the inside of the layer of said detached core, and/or an interface, and the process which makes said substrate secede from said detached core.

[0011] That is, the detached core with the property which absorbs light is prepared on the substrate with the high dependability in device manufacture, and thin films, such as TFT, are formed on the substrate. Next, although not limited especially, it joins to the imprint object of a request of a thin film, for example through a glue line, light is irradiated after that at a detached core, it produces and cheats out of an exfoliation phenomenon in the detached core by this, and the adhesion between the detached core and said substrate is reduced. And the force is applied to a substrate and the substrate is made to secede from a thin film. By this, a desired reliable device can be imprinted on any imprint objects (formation).

[0012] In addition, in this invention, the process which joins a thin film (transferred layer containing a thin film) to an imprint object through a glue line, and the process which makes a substrate secede from a thin film may not ask the sequence, but the point is sufficient as any. However, when a problem is in handling of the thin film (transferred layer containing a thin film) after making it secede from a substrate, it is desirable to join a thin film to an imprint object and to make it secede from a substrate after that first.

[0013] Moreover, if the matter (for example, thermosetting resin) with planation is used as a glue line used for junction on the imprint object of a thin film, though some level differences have arisen on the front face of the transferred layer containing a thin film, flattening of the level difference is carried out, it can be disregarded now, becomes joinable to an imprint object good therefore always, and is convenient.

[0014] (2) In claim 1, said substrate of this invention according to claim 2 is a substrate of translucency, and it is characterized by performing the exposure of said light to said detached core through the substrate of said translucency.

[0015] For example, if a substrate with a transparent quartz substrate etc. is used, while being able to manufacture a reliable thin film device, from the rear face of a substrate, light can be put in block all over a detached core, and can also be irradiated, and imprint effectiveness improves.

[0016] (3) This invention according to claim 3 is characterized by having further the process which removes said detached core adhering to said imprint object in claim 1 or claim 2.

[0017] An unnecessary detached core is removed completely.

[0018] (4) Said imprint object is characterized by this invention according to claim 4 being a transparence substrate in either claim 1 - claim 3.

[0019] For example, a substrate with a cheap soda glass substrate etc., the transparent plastic film which has flexibility can be used as an imprint object.

[0020] (5) When said imprint object sets the maximum temperature in the case of formation of a transferred layer to Tmax in either claim 1 - claim 4 in this invention according to claim 5, a glass transition point (Tg) or softening temperature is characterized by consisting of ingredients below said Tmax.

[0021] The maximum temperature at the time of device manufacture cannot be borne, but the cheap glass substrate which was not able to be used can be conventionally used now freely.

[0022] (6) In either claim 1 - claim 4, said imprint object is characterized by a glass transition point (Tg) or softening temperature being below the maximum temperature of the formation process of said thin film by this invention according to claim 6.

[0023] The upper limit of a glass transition point (Tg) or softening temperature is specified.

[0024] (7) This invention according to claim 7 is characterized by said imprint object consisting of synthetic resin or glass material in either claim 1 - claim 6.

[0025] For example, if a thin film is imprinted to the synthetic-resin plate which has the pliability (flexibility) of plastic film etc., in a rigid high glass substrate, an outstanding property which is not

acquired is realizable. If this invention is applied to a liquid crystal display, a pliant and light and display unit strong also against fall will be realized.
[0026] Moreover, for example, a substrate with a cheap soda glass substrate etc. can also be used as an imprint object. A soda glass substrate is a low price and is an advantageous substrate economically. The soda glass substrate had the problem that an alkali component was eluted by heat treatment at the time of TFT manufacture, and the application to the liquid crystal display of a active-matrix mold was difficult for it conventionally. However, in order to imprint the already completed thin film device according to this invention, the problem accompanying above-mentioned heat treatment is solved. Therefore, in the field of the liquid crystal display of a active-matrix mold, it becomes usable [a substrate with the conventional problems, such as a soda glass substrate,].
[0027] (8) This invention according to claim 8 is characterized by said substrate having thermal resistance in either claim 1 - claim 7.
[0028] High temperature processing of ****** becomes possible at the time of manufacture of a thin film device, and dependability can manufacture the thin film device of high performance highly.
[0029] (9) This invention according to claim 9 is characterized by said substrate being a substrate which penetrates 310nm light 10% or more in either claim 1 - claim 8.
[0030] The substrate of the translucency which can supply slack light energy for producing ablation in a detached core is used.
[0031] (10) When said substrate sets the maximum temperature in the case of formation of a transferred layer to Tmax in claim 1 - claim 9 in this invention according to claim 10, a point [distortion] is characterized by consisting of ingredients more than said Tmax.
[0032] Desired high temperature processing becomes possible at the time of manufacture of a thin film device, and dependability can manufacture the thin film device of high performance highly.
[0033] (11) Said detached core is characterized by this invention according to claim 11 consisting of amorphous silicons in either claim 1 - claim 10.
[0034] An amorphous silicon absorbs light, and the manufacture is also easy the amorphous silicon, and its practicality is high.
[0035] (12) This invention according to claim 12 is characterized by said amorphous silicon containing hydrogen (H) more than 2 atom % in claim 11.
[0036] When the amorphous silicon containing hydrogen is used, hydrogen is emitted with the exposure of light and there is an operation which produces internal pressure in a detached core and stimulates the exfoliation in a detached core by this.
[0037] (13) This invention according to claim 13 is characterized by said amorphous silicon containing hydrogen (H) more than 10 atom % in claim 12.
[0038] When the content of hydrogen increases, the operation to which the exfoliation in a detached core is urged becomes more remarkable.
[0039] (14) This invention according to claim 14 is characterized by said detached core consisting of silicon nitride in either claim 1 - claim 10.
[0040] If silicon nitride is used as a detached core, nitrogen will be emitted with the exposure of light and the exfoliation in a detached core will be promoted by this.
[0041] (15) This invention according to claim 15 is characterized by said detached core consisting of a hydrogen content alloy in either claim 1 - claim 10.
[0042] If a hydrogen content alloy is used as a detached core, hydrogen will be emitted with the exposure of light and the exfoliation in a detached core will be promoted by this.
[0043] (16) This invention according to claim 16 is characterized by said detached core consisting of a nitrogen content metal alloy in either claim 1 - claim 10.
[0044] If a nitrogen content alloy is used as a detached core, nitrogen will be emitted with the exposure of light and the exfoliation in a detached core will be promoted by this.
[0045] (17) This invention according to claim 17 It is the imprint approach of the thin film characterized by said detached core consisting of multilayers in either claim 1 - claim 10.
[0046] It shows clearly not to be limited to monolayer.

[0047] (18) Said multilayers are characterized by consisting of a metal membrane by which this invention according to claim 18 was formed the amorphous silicon film and on it in claim 17.
[0048] (19) In either claim 1 - claim 10, as for this invention according to claim 19, said detached core is characterized by the thing of the ceramics, a metal, and organic polymeric materials which consists of kinds at least.
[0049] A thing actually usable as a detached core is summarized and illustrated. As a metal, a hydrogen content alloy and a nitrogen content alloy are also usable, for example. In this case, the exfoliation in a detached core is promoted by emission of the hydrogen gas and the nitrogen gas accompanying the exposure of light like the case of an amorphous silicon.
[0050] (20) This invention according to claim 20 is characterized by said light being laser light in either claim 1 - claim 19.
[0051] Laser light is coherent light and suitable for producing exfoliation in a detached core.
[0052] (21) This invention according to claim 21 is characterized by the wavelength of said laser light being 100nm - 350nm in claim 20.
[0053] By using the laser light of light energy with short wavelength, exfoliation in a detached core can be performed effectively.
[0054] As laser which fulfills above-mentioned conditions, there is an excimer laser, for example. An excimer laser is gas laser in which the laser optical output of the high energy of a short wavelength ultraviolet region is possible, and can output the laser light of four kinds of typical wavelength by using what combined rare gas (Ar, Kr, Xe) and halogen gas (F2, HCl) as a laser medium (XeF=351nm, XeCl=308nm, KrF=248nm, ArF=193nm).
[0055] By the exposure of excimer laser light, it can produce and cheat out of the operation of direct cutting of molecular binding, evaporation of gas, etc. without a thermal effect in the detached core prepared on the substrate.
[0056] (22) This invention according to claim 22 is characterized by the wavelength of said laser light being 350nm - 1200nm in claim 20.
[0057] When making phase changes, such as a gas evolution, evaporation, and sublimation, cause and giving a separation property, the laser light whose wavelength is 350nm - about 1200nm is [in / a detached core] also usable.
[0058] (23) This invention according to claim 23 is characterized by said thin film being a thin film transistor (TFT) in either claim 1 - claim 22.
[0059] Highly efficient TFT can be freely imprinted on a desired imprint object (formation). Therefore, it also becomes possible to carry various electronic circuitries on the imprint object.
[0060] (24) In either claim 1 - claim 23, this invention according to claim 24 carries out multiple-times activation of the imprint approach according to claim 1, and is characterized by imprinting two or more transferred layers on said larger imprint object than said substrate.
[0061] The large-scale substrate in which the reliable thin film was carried can be created by repeating and using a reliable substrate or carrying out multiple-times activation of the imprint of a thin film pattern using two or more substrates.
[0062] (25) In either claim 1 - claim 24, this invention according to claim 25 carries out multiple-times activation of the imprint approach according to claim 1, and is characterized by imprinting two or more transferred layers from which the level of the design Ruhr of a thin film differs on said imprint object.
[0063] When it carries two or more circuits (functional block etc. is included) where classes differ on one substrate, according to the property required of each circuit, the component used for every circuit may differ from the size (what is called the design Ruhr, i.e., a design rule) of wiring. Also in this case, if the imprint is performed for every circuit using the imprint approach of this invention, two or more circuits where design Ruhr level differs are realizable on one substrate.
[0064] (26) This invention according to claim 26 is a thin film which said imprint object comes to imprint using the imprint approach according to claim 1 to 22.
[0065] It is the thin film formed on the substrate of arbitration using the imprint technique (imprint technique of a diaphragm structure) of the thin film of this invention.

[0066] (27) Said thin film is characterized by this invention according to claim 27 being a thin film transistor (TFT) in claim 26.
[0067] (28) This invention according to claim 28 is thin film integrated circuit equipment constituted including the thin film imprinted by said imprint object using the imprint approach according to claim 1 to 25.
[0068] For example, it is also possible to carry the single chip microcomputer constituted by using a thin film transistor (TFT) on the synthetic-resin substrate.
[0069] (29) This invention according to claim 29 is a active-matrix substrate with which the pixel section is constituted including the thin film transistor (TFT) arranged in the shape of a matrix, and the pixel electrode connected to the end of the thin film transistor, and is the active-matrix substrate manufactured by imprinting the thin film transistor of said pixel section using an approach according to claim 1 to 24.
[0070] It is the active-matrix substrate which comes to form the pixel section on a desired substrate using the imprint technique (imprint technique of a diaphragm structure) of the thin film of this invention. Since the constraint which comes from manufacture conditions is eliminated and a substrate can be chosen freely, it is also possible to realize the new active-matrix substrate which is not in the former.
[0071] (30) The thin film transistor connected to the scanning line with which this invention according to claim 30 has been arranged in the shape of a matrix, and a signal line (TFT), The pixel section is constituted including the pixel electrode connected to the end of the thin film transistor. And it is the active-matrix substrate which contains the driver circuit for supplying a signal in said scanning line and said signal line. It is a active-matrix substrate possessing the thin film transistor which constitutes the thin film transistor of said pixel section of the 1st design Ruhr level formed using the approach according to claim 25, and said driver circuit of the 2nd design Ruhr level.
[0072] On a active-matrix substrate, not only the pixel section but a driver circuit is carried, and, moreover, it is the active-matrix substrate with which the design Ruhr level of a driver circuit differs from the design Ruhr level of the pixel section. For example, if the thin film pattern of a driver circuit is formed using the manufacturing installation of Silicon TFT, it is possible to raise a degree of integration.

[0073] (31) This invention according to claim 31 is the liquid crystal display manufactured using the active-matrix substrate according to claim 29 to 30.
[0074] For example, the liquid crystal display with the property at which it turns flexibly using a plastic plate is also realizable.
[0075]
[Embodiment of the Invention] Next, the gestalt of operation of this invention is explained with reference to a drawing.
[0076] (Gestalt of the 1st operation) Drawing 1 - drawing 6 are drawings for explaining the gestalt (the imprint approach of a thin film) of operation of the 1st of this invention.
[0077] As shown in [process 1] drawing 1 , a detached core (light absorption layer) 120 is formed on a substrate 100.
[0078] Hereafter, a substrate 100 and a detached core 120 are explained.
[0079] ** As for the explanation substrate 100 about a substrate 100, it is desirable that it is what has the translucency which light may penetrate.
[0080] In this case, as for the permeability of light, it is desirable that it is 10% or more, and it is more desirable that it is 50% or more. When this permeability is too low, attenuation (loss) of light becomes large and needs the big quantity of light by exfoliating a detached core 120.
[0081] Moreover, as for a substrate 100, it is desirable to consist of reliable ingredients, and it is desirable to consist of ingredients which were excellent in thermal resistance especially. Although the reason has what process temperature becomes high depending on the class and formation approach (for example, about 350-1000 degrees C) in case it forms the transferred layer 140 and interlayer 142 who mention later, it is because the width of face of a setup of membrane formation conditions, such as the

temperature condition, will spread even in such a case on the occasion of formation of the transferred layer 140 grade to a substrate 100 top if the substrate 100 is excellent in thermal resistance.
[0082] Therefore, a substrate 100 has a desirable consisting-of [the strain point]-ingredients more than Tmax thing, when the maximum temperature in the case of formation of the transferred layer 140 is set to Tmax. A thing 350 degrees C or more has a desirable strain point, and, specifically, the component of a substrate 100 has a more desirable thing 500 degrees C or more. As such a thing, the heat resisting glass of quartz glass, Corning 7059, and NEC glass OA-2 grade is mentioned, for example.
[0083] Moreover, although especially the thickness of a substrate 100 is not limited, it is desirable that it is about 0.1-5.0mm, and it is usually more desirable that it is about 0.5-1.5mm. If the thickness of a substrate 100 is too thin, a strong fall will be caused, and if too thick, when the permeability of a substrate 100 is low, it will become easy to produce attenuation of light. In addition, when the permeability of the light of a substrate 100 is high, the thickness may exceed said upper limit. In addition, as for the thickness of a substrate 100, it is desirable that it is uniform so that light can be irradiated at homogeneity.
[0084] ** As for the explanation detached core 120 of a detached core 120, what the light irradiated is absorbed, it has a property which produces exfoliation (henceforth "exfoliation in a layer", and "interfacial peeling") in the inside of the layer and/or an interface, and it arises preferably that the bonding strength between the atoms of the matter which constitutes a detached core 120, or between molecules disappears or decreases by the exposure of light, i.e., ablation, and results in the exfoliation in a layer and/or interfacial peeling is good.
[0085] Furthermore, a gas may be emitted by the exposure of light from a detached core 120, and the separation effectiveness may be discovered. That is, a detached core 120 absorbs light, it becomes a gas to the case where the component contained in the detached core 120 serves as a gas, and it is emitted for a moment, the steam is emitted, and it may contribute to separation. As a presentation of such a detached core 120, what is indicated by following A-E is mentioned, for example.
[0086] A. Amorphous silicon (a-Si)
Hydrogen (H) may contain in this amorphous silicon. In this case, as for the content of H, it is desirable that it is extent more than 2 atom %, and it is more desirable that it is 2 - 20 atom % extent. Thus, if specified quantity content of the hydrogen (H) is carried out, hydrogen will be emitted by the exposure of light, internal pressure will occur in a detached core 120, and it will become the force in which it exfoliates an up-and-down thin film. The content of the hydrogen in an amorphous silicon (H) can be adjusted by setting up suitably conditions, such as membrane formation conditions, for example, the gas presentation in CVD, gas pressure, a gas ambient atmosphere, a quantity of gas flow, temperature, substrate temperature, and injection power.
[0087] B. As various oxide ceramics, such as silicon oxide or a silicic-acid compound, titanium oxide or a titanic-acid compound, a zirconium dioxide or a zirconic acid compound, a lanthanum trioxide, or a lanthanum oxidation compound, ****** (ferroelectric), or semi-conductor silicon oxide, SiO, SiO2, and Si 3O2 are mentioned, and K2SiO3, Li2SiO3, CaSiO3 and ZrSiO4, and Na2SiO3 are mentioned as a silicic-acid compound, for example.
[0088] TiO, Ti203, and Ti02 mention as titanium oxide -- having -- as a titanic-acid compound -- BaTi04, BaTiO3, Ba2Ti 9O20, BaTi 5O11, and CaTiO3, SrTiO3, PbTiO3, MgTiO3, ZrTiO2, SnTiO4 and aluminum2 -- TiO5 and FeTiO3 are mentioned.
[0089] As a zirconium dioxide, ZrO2 is mentioned and BaZrO3, ZrSiO4, PbZrO3, MgZrO3, and K2ZrO3 are mentioned as a zirconic acid compound, for example.
[0090] C. The ceramics or dielectrics (ferroelectric), such as PZT, PLZT, PLLZT, and PBZT
D. As nitride-ceramics E. organic polymeric-materials organic polymeric materials, such as silicon nitride, nitriding aluminum, and titanium nitride - CH-, -CO- (ketone), -CONH- (amide), -NH- (imide), - As long as it is what has association (these association is cut by the exposure of light) of COO- (ester), - N=N- (azo), -CH=N- (CIF), etc., and the thing which has many these association especially, what kind of thing may be used. Moreover, organic polymeric materials may have aromatic hydrocarbon (1, two or more benzene rings, or condensed ring of those) in a constructive mood.

[0091] As an example of such organic polymeric materials, polyethylene, polyolefine like polypropylene, polyimide, a polyamide, polyester, polymethylmethacrylate (PMMA), polyphenylene sulfide (PPS), polyether sulphone (PES), an epoxy resin, etc. are raised.
[0092] F. As a metal metal, the alloy containing at least one of aluminum, Li, Ti, Mn, In, Sn, Y, La, Ce, Nd, Pr, Gd, Sm, or sorts of these is mentioned, for example.
[0093] Moreover, although the thickness of a detached core 120 changes with terms and conditions, such as a presentation of the exfoliation purpose or a detached core 120, lamination, and the formation approach, it is desirable that it is 1nm - about 20 micrometers, it is more desirable that it is 10nm - about 2 micrometers, and it is usually still more desirable [thickness] that it is 40nm - about 1 micrometer. While enlarging power (quantity of light) of light in order to secure the good detachability of a detached core 120 if the homogeneity of membrane formation is spoiled, nonuniformity may arise in exfoliation, when the thickness of a detached core 120 is too small, and thickness is too thick, in case a detached core 120 is removed behind, the activity takes time amount. In addition, as for the thickness of a detached core 120, it is desirable that it is uniform as much as possible.
[0094] Especially the formation approach of a detached core 120 is not limited, but is suitably chosen according to terms and conditions, such as a film presentation and thickness. For example, it CVD(s) (MOCVD and low voltage -- CVD and ECR-CVD are included). Vacuum evaporationo, molecular beam deposition (MB), sputtering, ion plating, The various gaseous-phase forming-membranes methods, such as PVD, electroplating, immersion plating (dipping), various plating, such as electroless deposition, and the Langmuir pro jet (LB) -- law -- The applying methods, such as a spin coat, a spray coat, and a roll coat, various print processes, a replica method, the ink jet method, a powder jet process, etc. are mentioned, and it can also form or more [of these] combining two.
[0095] For example, when the presentation of a detached core 120 is an amorphous silicon (a-Si), it is desirable to form membranes by CVD especially low voltage CVD, or plasma CVD.
[0096] Moreover, when a detached core 120 is constituted from ceramics by the sol-gel method, or when it constitutes from organic polymeric materials, it is desirable the applying method and to form membranes with a spin coat especially.
[0097] As shown in [a process 2], next drawing 2 , the transferred layer (thin film device layer) 140 is formed on a detached core 120.
[0098] The expanded sectional view of K part (part shown by surrounding with 1 dotted-line chain line in drawing 2) of this thin film device layer 140 is shown in the right-hand side of drawing 2 . It is constituted including TFT (thin film transistor) formed on SiO2 film (middle class) 142, and the thin film device layer 140 possesses the source and the drain layer 146 which this TFT introduced n mold impurity into the polish recon layer, and were formed, the channel layer 144, gate dielectric film 148, the gate electrode 150, an interlayer insulation film 154, and the electrode 152 that consists of aluminum so that it may be illustrated.
[0099] Although Si02 film is used with the gestalt of this operation as an interlayer prepared in contact with a detached core 120, the insulator layer of others, such as Si3N4, can also be used. Although the thickness of Si02 film (interlayer) is suitably determined according to the formation purpose or extent of a function which can be demonstrated, it is desirable that it is 10nm - about 5 micrometers, and it is usually more desirable that it is 40nm - about 1 micrometer. What demonstrates at least one of the functions as the protective layer which an interlayer is formed for the various purpose, for example, protects the transferred layer 140 physically or chemically, an insulating layer, a conductive layer, the protection-from-light layer of laser light, the barrier layer for migration prevention, and a reflecting layer is mentioned.
[0100] In addition, the middle class, such as Si02 film, may not be formed depending on the case, but the direct transferred layer (thin film device layer) 140 may be formed on a detached core 120.
[0101] The transferred layer 140 (thin film device layer) is a layer containing thin films, such as TFT as shown in the right-hand side of drawing 2 R> 2.
[0102] the optoelectric transducer (a photosensor --) which consists of a thin-film diode and PIN junction of silicon besides TFT as a thin film A solar battery, a silicon resistance element and other thin

film semiconductor devices, an electrode (it ITO(s) example:) Actuators, such as a transparent electrode like the mesa film, a switching element, memory, and a piezoelectric device, There are a micro MAG device which combined a micro mirror (piezo thin film ceramics), a magnetic-recording thin film head, a coil, an inductor, the charge of a thin film quantity magnetic-permiable material, and them, a filter, reflective film, a dichroic mirror, etc.

[0103] Such a thin film (thin film device) is relation with the formation approach, and is formed through usually comparatively high process temperature. Therefore, as mentioned above in this case, as a substrate 100, the thing which has high dependability and which can bear that process temperature is needed.

[0104] As shown in [a process 3], next drawing 3 , the thin film device layer 140 is joined to the imprint object 180 through a glue line 160 (adhesion).

[0105] As a suitable example of the adhesives which constitute a glue line 160, various hardening mold adhesives, such as photo-curing mold adhesives, such as reaction hardening mold adhesives, heat-curing mold adhesives, and ultraviolet curing mold adhesives, and aversion hardening mold adhesives, are mentioned. As a presentation of adhesives, what kind of thing is sufficient as an epoxy system, an acrylate system, a silicone system, etc., for example. Formation of such a glue line 160 is made for example, by the applying method.

[0106] After applying hardening mold adhesives on the transferred layer (thin film device layer) 140 and joining the imprint object 180 on it when using said hardening mold adhesives for example, said hardening mold adhesives are stiffened by the hardening approach according to the property of hardening mold adhesives, and the transferred layer (thin film device layer) 140 and the imprint object 180 are pasted up, and it fixes.

[0107] when adhesives are photo-curing molds, light is irradiated from the substrate of light transmission nature, and both the outsides of an imprint object or -- from one outside of the substrate 100 of light transmission nature, or the imprint object 180 of light transmission nature. As adhesives, photo-curing mold adhesives, such as an ultraviolet curing mold which cannot affect a thin film device layer easily, are desirable.

[0108] In addition, unlike illustration, a glue line 160 may be formed in the imprint object 180 side, and the transferred layer (thin film device layer) 140 may be pasted up on it. In addition, when imprint object 180 the very thing has an adhesion function, for example, formation of a glue line 160 may be omitted.

[0109] although not limited especially as an imprint object 180 -- a substrate (plate) -- especially a transparence substrate is mentioned. In addition, such a substrate may be monotonous or may be a curve plate. Moreover, compared with said substrate 100, properties, such as thermal resistance and corrosion resistance, may be inferior in the imprint object 180. It is because the reason forms the transferred layer (thin film device layer) 140 in a substrate 100 side in this invention, and imprints the transferred layer (thin film device layer) 140 on the imprint object 180 after that, so it does not depend on the temperature conditions in the case of formation of the transferred layer (thin film device layer) 140 etc. for the property required of the imprint object 180, especially thermal resistance.

[0110] Therefore, when the maximum temperature in the case of formation of the transferred layer 140 is set to Tmax, a glass transition point (Tg) or softening temperature can use the following [Tmax] as a component of the imprint object 0. For example, a glass transition point (Tg) or softening temperature can constitute more preferably 800 degrees C or less of 500 degrees C or less of imprint objects 180 from an ingredient 320 degrees C or less still more preferably.

[0111] Moreover, although what has a certain amount of rigidity (reinforcement) as a mechanical property of the imprint object 180 is desirable, you may have flexibility and elasticity.

[0112] As a component of such an imprint object 180, various synthetic resin or various glass material are mentioned, and various synthetic resin and the usual cheap glass material (low-melt point point) are desirable especially.

[0113] As synthetic resin, any of thermoplastics and thermosetting resin are sufficient. For example, polyethylene, a polo propylene, an ethylene-pre pyrene copolymer, Polyolefines, such as an ethylene-vinylacetate copolymer (EVA), annular polyolefine, Denaturation polyolefine, a polyvinyl chloride, a

polyvinylidene chloride, polystyrene, A polyamide, polyimide, polyamidoimide, a polycarbonate, Polly (4-methyl BENTEN -1), An ionomer, acrylic resin, polymethylmethacrylate, an acrylic-styrene copolymer (AS resin), Butadiene Styrene, a polio copolymer (EVOH), polyethylene terephthalate (PET), Polyester, such as polyp CHIREN terephthalate (PBT) and PURISHI clo hexane terephthalate (PCT), A polyether, a polyether ketone (PEK), a polyether ether ketone (PEEK), Polyether imide, polyacetal (POM), polyphenylene oxide, Denaturation polyphenylene oxide, polyarylate, aromatic polyester (liquid crystal polymer), Polytetrafluoroethylene, polyvinylidene fluoride, other fluororesin, A styrene system, a polyolefine system, a polyvinyl chloride system, a polyurethane system, Various thermoplastic elastomer, such as a fluororubber system and a chlorinated polyethylene system, EBOKISHI resin, phenol resin, a urea resin, melamine resin, unsaturated polyester, The copolymer which is mainly concerned with these, a blend object, a polymer alloy, etc. are mentioned, and silicone resin, polyurethane, etc. can be used combining 1 of sorts of these, and two sorts or more (as a layered product for example, more than two-layer).

[0114] As glass material, silicic-acid glass (quartz glass), silicic-acid alkali glass, soda lime glass, potash lime glass, lead (alkali) glass, barium glass, borosilicate glass, etc. are mentioned, for example. Among these, compared with silicic-acid glass, the melting point is low, and shaping and processing are also comparatively easy the melting point, and, moreover, things other than silicic-acid glass have it, and are desirable. [cheap]

[0115] When using what consisted of synthetic resin as an imprint object 180, while being able to fabricate the large-scale imprint object 180 in one, even if it is complicated configurations, such as what has a curve side and irregularity, it can manufacture easily, and the various advantages that ingredient cost and a manufacturing cost are also cheap can be enjoyed. Therefore, use of synthetic resin is advantageous when manufacturing a large-sized and cheap device (for example, liquid crystal display).

[0116] In addition, the imprint object 180 may constitute some devices like what constitutes the device which became independent in itself like a liquid crystal cell, a color filter and an electrode layer, a dielectric layer, an insulating layer, and a semiconductor device.

[0117] Furthermore, the imprint objects 180 may be matter, such as a metal, ceramics, a stone, and wood paper, and may be on the front face of the structures, such as a wall, a column, head lining, and a windowpane, further on the field of the arbitration which constitutes a certain article (superiors of the front-face top of the field top of a clock, and an air-conditioner, and a printed circuit board).

[0118] As shown in [a process 4], next drawing 4 , light is irradiated from the rear-face side of a substrate 100.

[0119] After this light penetrates a substrate 100, it is irradiated by the detached core 120. Thereby, the exfoliation in a layer and/or interfacial peeling arise in a detached core 120, and bonding strength is decreased or extinguished.

[0120] It is presumed that it is what is depended on phase changes, such as that ablation produces the principle which the exfoliation in a layer and/or interfacial peeling of a detached core 120 produce in the component of a detached core 120 and emission of the gas contained in the detached core 120, melting further produced immediately after an exposure, and evapotranspiration.

[0121] The fixed ingredient (component of a detached core 120) which absorbed exposure light is excited photochemistry-wise or thermally, ablation means association of the atom of the front face and interior or a molecule being cut, and emitting here, and it mainly appears as a phenomenon in which all or a part of component of a detached core 120 produces phase changes, such as melting and evapotranspiration (evaporation). Moreover, by said phase change, it may be in a minute firing condition and bonding strength may decline.

[0122] Conditions, such as a presentation of a detached core 120, and a class of light irradiated as one of the factor of the, wavelength, reinforcement, the attainment depth, are mentioned by in addition to this being influenced by various factors they are [whether a detached core 120 produces the exfoliation in a layer interfacial peeling is produced, or] the both.

[0123] As a light to irradiate, if a detached core 120 is made to start the exfoliation in a layer, and/or interfacial peeling, what kind of thing may be used, for example, an X-ray, ultraviolet rays, the light,

infrared radiation (heat ray), a laser beam, a millimeter wave, microwave, an electron ray, a radiation (alpha rays, beta rays, gamma ray), etc. will be mentioned. A laser beam is desirable at the point of being easy to produce exfoliation (ablation) of a detached core 120 also in it.

[0124] As laser equipment made to generate this laser beam, although various gas laser, solid state laser (semiconductor laser), etc. are mentioned, excimer laser, Nd-YAG laser, Ar laser, a CO2 laser, a CO laser, helium-Ne laser, etc. are used suitably, and especially excimer laser is desirable also in it.

[0125] Since it outputs high energy in a short wavelength region, extremely, excimer laser can make a detached core 2 produce ablation for a short time, and it can exfoliate a detached core 120, without making the imprint object 180 and substrate 100 grade which therefore adjoin produce most temperature rises (i.e., without it producing degradation and damage).

[0126] Moreover, when it makes it faced that a detached core 120 produces ablation and there is a wavelength dependency of light, as for the wavelength of the laser beam irradiated, it is desirable that it is 100nm - about 350nm.

[0127] An example of permeability to the wavelength of light of a substrate 100 is shown in drawing 7 . It has the property that permeability increases steeply to the wavelength of 300nm so that it may be illustrated. In such a case, light (for example, Xe-Cl excimer laser light with a wavelength of 308nm) with a wavelength of 300nm or more is irradiated.

[0128] Moreover, when making a detached core 120 cause phase changes, such as a gas evolution, evaporation, and sublimation, and giving a separation property to it, as for the wavelength of the laser beam irradiated, it is desirable that it is about 350 to 1200nm.

[0129] Moreover, as for especially the energy density in the case of excimer laser, it is desirable the energy density of the laser beam irradiated and to consider as about two 10 - 5000 mJ/cm, and it is more desirable to consider as about two 100 - 500 mJ/cm. Moreover, as for irradiation time, it is desirable to be referred to as about 1 - 1000ns, and it is more desirable to be referred to as about 10 - 100ns. When sufficient ablation etc. does not arise, and an energy density is high, when an energy density is low or irradiation time is short, or irradiation time is long, there is a possibility of having a bad influence on the transferred layer 140 by the exposure light which penetrated the detached core 120.

[0130] In addition, as a cure in case the exposure light which penetrated the detached core 120 reaches even the transferred layer 140 and does a bad influence, as shown in drawing 30 , there is the approach of forming the metal membranes 124, such as a tantalum (Ta), on a detached core (laser absorption layer) 120, for example. Thereby, it is completely reflected by the interface of a metal membrane 124, and the laser light which penetrated the detached core 120 does not have a bad influence on the thin film above it.

[0131] As for the exposure light represented by the laser beam, it is desirable to irradiate so that the reinforcement may become uniform. The direction of radiation of exposure light may be a direction which carried out the predetermined include-angle inclination not only to a perpendicular direction but to the detached core 120 to the detached core 120.

[0132] Moreover, when the area of a detached core 120 is larger than the exposure area which is 1 time of exposure light, to all the fields of a detached core 120, it can divide into multiple times and exposure light can also be irradiated. Moreover, the same part may be irradiated twice or more. Moreover, the exposure light (laser beam) of a different class and different wavelength (wavelength region) may be irradiated twice or more to the same field or a different field.

[0133] Next, the force is applied to a substrate 100 and this substrate 100 is made to secede from a detached core 120, as shown in drawing 5 . Although not illustrated in drawing 5 , a detached core may adhere on a substrate 100 after this balking.

[0134] Next, as shown in drawing 6 , the extant detached core 120 is removed by the approach which combined approaches, such as washing, etching, ashing, and polish, or these. It means that the transferred layer (thin film device layer) 140 had been imprinted by the imprint object 180 by this.

[0135] In addition, when a part of detached core has adhered also to the substrate 100 from which it seceded, it removes similarly. In addition, when the substrate 100 consists of an expensive ingredient like quartz glass, and a rare ingredient, reuse (recycle) is preferably presented with a substrate 100. That

is, this invention can be applied to the substrate 100 to reuse, and usefulness is high.
[0136] The imprint to the imprint object 180 of the transferred layer (thin film device layer) 140 is completed through each above process. Then, conductive layers, such as removal of SiO2 film which adjoins the transferred layer (thin film device layer) 140, and wiring of a up to [the transferred layer 140], formation of a desired protective coat, etc. can also be performed.
[0137] In this invention, transferred layer (thin film device layer) 140 the very thing which is an exfoliated object is not exfoliated directly. Since it exfoliates in the detached core joined to the transferred layer (thin film device layer) 140, Irrespective of the property of an exfoliated object (transferred layer 140), conditions, etc., easily and certainly, it can exfoliate in homogeneity (imprint), there is also no damage to the exfoliated object (transferred layer 140) in accordance with exfoliation actuation, and the high dependability of the transferred layer 140 can be maintained.
[0138] (Gestalt of the 2nd operation) TFT of CMOS structure is formed on a substrate and the example of the concrete manufacture process in the case of imprinting this on an imprint object is explained using drawing 8 - drawing 18 .
[0139] (Process 1) as shown in drawing 8, on a substrate (for example, quartz substrate) 100, laminating formation of a detached core (for example, LPCVD amorphous silicon layer formed of law) 120, an interlayer (for example, SiO2 film) 142, and the amorphous silicon layer (for example, LPCVD -- formed of law) 143 is carried out one by one, then laser light is irradiated from the upper part all over the amorphous silicon layer 143, and annealing is given. Thereby, the amorphous silicon layer 143 is recrystallized and turns into a polish recon layer.
[0140] (Process 2) Then, as shown in drawing 9 , patterning of the polish recon layer obtained by laser annealing is carried out, and Islands 144a and 144b are formed.
[0141] (Process 3) As shown in drawing 10 , wrap gate dielectric film 148a and 148b is formed for Islands 144a and 144b with a CVD method.
[0142] (Process 4) As shown in drawing 11 , the gate electrodes 150a and 150b which consist of polish recon or metal are formed.
[0143] (Process 5) As shown in drawing 12 , the mask layer 170 which consists of polyimide etc. is formed, using gate electrode 150b and the mask layer 170 as a mask, it is a self aryne, for example, the ion implantation of boron (B) is performed. Of this, the p+ layers 172a and 172b are formed.
[0144] (Process 6) As shown in drawing 13 , the mask layer 174 which consists of polyimide etc. is formed, using gate electrode 150a and the mask layer 174 as a mask, it is a self aryne, for example, the ion implantation of Lynn (P) is performed. Of this, the n+ layers 146a and 146b are formed.
[0145] (Process 7) As shown in drawing 14 , an interlayer insulation film 154 is formed and Electrodes 152a-152d are alternatively formed after contact hole formation.
 [0146] Thus, TFT of the formed CMOS structure corresponds to the transferred layer (thin film device layer) 140 in drawing 2 - drawing 6 . In addition, a protective coat may be formed on an interlayer insulation film 154.
[0147] (Process 8) As shown in drawing 15 , the epoxy resin layer 160 as a glue line is formed on TFT of a CMOS configuration, next TFT is stuck on the imprint object (for example, soda glass substrate) 180 through the epoxy resin layer 160. Then, heat is applied, an epoxy resin is stiffened and the imprint object 180 and TFT are pasted up (junction).
[0148] In addition, the photopolymer resin which is ultraviolet curing mold adhesives is sufficient as a glue line 160. In this case, ultraviolet rays are irradiated from the imprint object [not heat but] 180 side, and a polymer is stiffened.
[0149] (Process 9) As shown in drawing 16 , Xe-Cl excimer laser light is irradiated from the rear face of a substrate 100, for example. This produces and cheats out of exfoliation in the inside of the layer of a detached core 120, and/or an interface.
[0150] (Process 10) A substrate 100 is torn off as shown in drawing 17 .
[0151] (Process 11) Finally etching removes a detached core 120. It means that TFT of a CMOS configuration had been imprinted by the imprint object 180 by this as shown in drawing 18 .
[0152] (Gestalt of the 3rd operation) If the technique explained with the gestalt of the 1st operation of a **** and the gestalt of the 2nd operation is used, the microcomputer constituted using the thin film as

shown in drawing 19 (a), for example can be formed on a desired substrate.
[0153] In drawing 19 (a), the solar battery 340 possessing the PIN junction of an amorphous silicon for supplying the supply voltage of CPU300, RAM320 and the I/O circuits 360 where the thin film was used and the circuit was constituted, and these circuits is carried on the flexible substrate 182 which consists of plastics etc.
[0154] Since the microcomputer of drawing 19 (a) is formed on the flexible substrate, as shown in drawing 19 (b), since it is lightweight, it has strongly the description that it is strong also to fall in bending.
[0155] (Gestalt of the 4th operation) The gestalt of this operation explains the example of the manufacture process in the case of creating the liquid crystal display of the active-matrix mold using a active-matrix substrate as shown in drawing 20 and drawing 21 R> 1 using the imprint technique of an above-mentioned thin film device.
[0156] (Configuration of a liquid crystal display) As shown in drawing 20 , the liquid crystal display of a active-matrix mold possesses the sources 400 of the illumination light, such as a back light, a polarizing plate 420, the active-matrix substrate 440, liquid crystal 460, the opposite substrate 480, and a polarizing plate 500.
[0157] In addition, if it constitutes as a reflective mold liquid crystal panel which replaced with the source 400 of the illumination light, and adopted the reflecting plate when using a flexible substrate like plastic film for the active-matrix substrate 440 and the opposite substrate 480 of this invention, there is flexibility and a lightweight active matrix liquid crystal panel strong against an impact and can be realized. In addition, when a pixel electrode is formed with a metal, a reflecting plate and a polarizing plate 420 become unnecessary.
[0158] The active-matrix substrate 440 used with the gestalt of this operation arranges TFT in the pixel section 442, and is a driver built-in active-matrix substrate in which the driver circuit (a scanning-line driver and data-line driver) 444 was carried further.
[0159] The sectional view of the important section of this active matrix liquid crystal display is shown in drawing 21 , and the circuitry of the important section of a liquid crystal display is shown in drawing 22 .
[0160] As shown in drawing 22 , the gate is connected to the gate line G1, one side of a source drain is connected to the data line D1, and the pixel section 442 contains TFT (M1) by which another side of a source drain was connected to liquid crystal 460, and liquid crystal 460.
[0161] Moreover, the driver section 444 is constituted including TFT (M2) formed of the same process as TFT (M1) of the pixel section.
[0162] As shown in the left-hand side of drawing 21 , TFT (M1) in the pixel section 442 is constituted including the source drain layers 1100a and 1100b, channel 1100e, gate-dielectric-film 1200a, gate electrode 1300a, an insulator layer 1500, and the source drain electrodes 1400a and 1400b.
[0163] In addition, a reference number 1700 is a pixel electrode and a reference number 1702 shows the field (electrical-potential-difference impression field to liquid crystal) where the pixel electrode 1700 impresses an electrical potential difference to liquid crystal 460. The orientation film is omitted among drawing. The pixel electrode 1700 is constituted by metals (in the case of the liquid crystal panel of a reflective mold), such as ITO (in the case of the liquid crystal panel of a light transmission mold), or aluminum. Moreover, in drawing 21 , in the electrical-potential-difference impression field 1702 to liquid crystal, although the substrate insulator layer 1000 under the pixel electrode 1700 (interlayer) is removed completely, it is not necessarily limited to this, and since the substrate insulator layer (interlayer) 1000 is thin, when not becoming the hindrance of the electrical-potential-difference impression to liquid crystal, you may leave.
[0164] Moreover, as shown in the right-hand side of drawing 21 , TFT (M2) which constitutes the driver section 444 is constituted including the source, the drain layers 1100c and 1100d, channel 1100f, gate-dielectric-film 1200b, gate electrode 1300b, an insulator layer 1500, and the source drain electrodes 1400c and 1400d.
[0165] In addition, in drawing 21 , a reference number 480 is for example, an opposite substrate (for

example, soda glass substrate), and a reference number 482 is a common electrode. Moreover, a reference number 1000 is SiO2 film, a reference number 1600 is an interlayer insulation film (for example, SiO2 film), and a reference number 1800 is a glue line. Moreover, a reference number 1900 is a substrate (imprint object) which consists for example, of a soda glass substrate.

[0166] (Manufacture process of a liquid crystal display) The manufacture process of the liquid crystal display of drawing 2121 is hereafter explained with reference to drawing 23 - drawing 27 .

[0167] First, it forms through the same manufacture process as drawing 8 - drawing 18 on the substrate (for example, quartz substrate) 3000 which it is reliable in TFT (M1, M2) like drawing 23 , and penetrates laser light, and a protective coat 1600 is constituted. In addition, in drawing 23 , a reference number 3100 is a detached core (laser absorption layer). Moreover, in drawing 23 , both TFT(s) (M1, M2) are taken as MOSFET of n mold. However, it is good also as not the thing limited to this but MOSFET of p mold, and CMOS structure.

[0168] Next, as shown in drawing 24 , a protective coat 1600 and the substrate insulator layer 1000 are etched alternatively, and openings 4000 and 4200 are formed alternatively. These two openings are formed in coincidence using a common etching process. In addition, although the substrate insulator layer (interlayer) 1000 is completely removed in opening 4200 in drawing 24 , it is not necessarily limited to this, and since the substrate insulator layer (interlayer) 1000 is thin, when not becoming the hindrance of the electrical-potential-difference impression to liquid crystal, you may leave.

[0169] Next, as shown in drawing 25 , the pixel electrode 1700 which consists of metals, such as ITO film or aluminum, is formed. In using the ITO film, it becomes the liquid crystal panel of a transparency mold, and in using metals, such as aluminum, it becomes the liquid crystal panel of a reflective mold. Next, as shown in drawing 26 , a substrate 1900 is joined through a glue line 1800 (adhesion).

[0170] Next, as shown in drawing 26 , excimer laser light is irradiated from the rear face of a substrate 3000, and a substrate 3000 is torn off after this.

[0171] Next, a detached core (laser absorption layer) 3100 is removed. Thereby, the active-matrix substrate 440 as shown in drawing 27 is completed. It has exposed and the electric connection with liquid crystal is possible for the base (field of a reference number 1702) of the pixel electrode 1700. Then, the orientation film is formed in the front face of the insulator layer (interlayers, such as SiO2) 1000 of the active-matrix substrate 440, and pixel electrode 1702 front face, and orientation processing is performed. The orientation film is omitted in drawing 27 .

[0172] And the pixel electrode 1709 and the common electrode which counters are further formed in the front face, the opposite substrate 480 and the active MATORIKU substrate 440 of drawing 21 with which orientation processing of the front face was carried out are closed with a sealing agent (sealant), liquid crystal is enclosed among both substrates, and a liquid crystal display as shown in drawing 21 is completed.

[0173] (Gestalt of the 5th operation) The gestalt of operation of the 5th of this invention is shown in drawing 28 .

[0174] With the gestalt of this operation, multiple-times activation of the imprint approach of an above-mentioned thin film device is carried out, on a larger substrate (imprint object) than the substrate of an imprinting agency, two or more patterns containing a thin film are imprinted, and, finally a large-scale active-matrix substrate is formed.

[0175] That is, on the big substrate 7000, the imprint of multiple times is performed and the pixel sections 7100a-7100P are formed. TFT and wiring are formed in the pixel section as surrounded and shown to the drawing 28 bottom by the alternate long and short dash line. In drawing 28 R> 8, a reference number 7210 is the scanning line, a reference number 7200 is a signal line and a reference number 7230 is [a reference number 7220 is a gate electrode and] a pixel electrode.

[0176] The large-scale active-matrix substrate in which the reliable thin film was carried can be created by repeating and using a reliable substrate or carrying out multiple-times activation of the imprint of a thin film pattern using two or more 1st substrates.

[0177] (Gestalt of the 6th operation) The gestalt of operation of the 6th of this invention is shown in drawing 29 .

[0178] The description of the gestalt of this operation is imprinting two or more patterns containing the thin film (that is, thin film from which minimum line width's differs) from which multiple-times activation of the imprint approach of an above-mentioned thin film device is carried out, and the design Ruhr's (that is, design rule's when carrying out a pattern design's) differs on a bigger substrate than the substrate top of an imprinting agency.
[0179] In drawing 29 , the driver circuit (8000-8032) created in the more detailed manufacture process rather than the pixel section (7100a-7100p) is created around the substrate 6000 by the imprint of multiple times in the active-matrix substrate of driver loading.
[0180] Since the shift register which constitutes a driver circuit carries out actuation of a logic level to the bottom of a low battery, rather than Pixel TFT, pressure-proofing may be low, and as it is therefore set to TFT more detailed than Pixel TFT, high integration can be attained.
[0181] According to the gestalt of this operation, two or more circuits where design Ruhr level differs (that is, manufacture processes differ) are realizable on one substrate. In addition, since high pressure-proofing is the need like Pixel TFT, a sampling means (thin film transistor M2 of drawing 22) to sample a data signal by control of a shift register is good to form in the same process as Pixel TFT / same design Ruhr.
[0182]
[Example] Next, the concrete example of this invention is explained.
[0183] (Example 1) The quartz substrate (1630 degrees C, a strain point: softening temperature : 1070 degrees C, permeability of excimer laser : about 100%) with a 50mm[50mm by] x thickness of 1.1mm was prepared, and the amorphous silicon (a-Si) film was formed in one side of this quartz substrate as a detached core (laser beam absorption layer) with the low voltage CVD method (Si2 H6 gas, 425 degrees C). The thickness of a detached core was 100nm.
[0184] Next, it is SiO2 as an interlayer on a detached core. The film was formed with the ECR-CVD method (SiH4+O2 gas, 100 degrees C). An interlayer's thickness was 200nm.
[0185] Next, the amorphous silicon film of 50nm of thickness was formed as a transferred layer on the interlayer with the low voltage CVD method (Si2 H6 gas, 425 degrees C), a laser beam (wavelength of 308nm) is irradiated, this amorphous silicon film was crystallized, and it considered as the polish recon film. Then, to this polish recon film, predetermined pattern NINGU was given and the field used as the source drain channel of a thin film transistor was formed. Then, a polish recon film front face is oxidized thermally according to the elevated temperature more than 1000-degreeC, and it is gate dielectric film SiO2. After forming, form a gate electrode (structure where laminating formation of the refractory metals, such as Mo, was carried out at polish recon), on gate dielectric film, and it carries out an ion implantation, using a gate electrode as a mask -- self align ---like (selfer line) -- the source drain field was formed and the thin film transistor was formed. Then, the electrode connected to a source drain field and wiring, and wiring which leads to a gate electrode are formed if needed. Although aluminum is used for these electrodes and wiring, it is not limited to this. Moreover, when worrying about melting of aluminum by the laser radiation of a back process, a high-melting metal (what is not fused by the laser radiation of a back process) may be used rather than aluminum.
[0186] Next, ultraviolet curing mold adhesives were applied on said thin film transistor (thickness: 100 micrometers), further, after joining a transparent large-sized glass substrate (soda glass, softening-temperature:740 degree C, a strain point: 511 degrees C) with a 300mm[200mm by] x thickness of 1.1mm to the paint film as an imprint object, ultraviolet rays were irradiated from the glass substrate side, adhesives were stiffened, and adhesion immobilization of these was carried out.
[0187] Next, Xe-Cl excimer laser (wavelength: 308nm) was irradiated from the quartz substrate side, and the detached core was made to produce exfoliation (exfoliation in a layer, and interfacial peeling). The irradiated energy density of Xe-Cl excimer laser was 250 mJ/cm2, and irradiation time was 20ns. In addition, the exposure of excimer laser has a spot beam exposure and the Rhine beam exposure, and when it is a spot beam exposure, a spot exposure is carried out to a predetermined unit field (for example, 8mmx8mm), and while a unit field shifts this spot exposure about [every] 1/10, it is irradiated. Moreover, in the Rhine beam exposure, it irradiates, shifting a predetermined unit field (for

example, 378mmx0.1mm and 378mmx0.3mm (field where, as for these, 90% or more of energy is obtained)) about [every] 1/10 similarly. Thereby, each point of a detached core receives at least ten exposures. This laser radiation is carried out to the whole quartz substrate surface, shifting an exposure field.

[0188] Then, the quartz substrate and the glass substrate (imprint object) were torn off in the detached core, and the thin film transistor and interlayer who were formed on the quartz substrate were imprinted to the glass substrate side.

[0189] Then, etching, washing, or those combination removed the detached core adhering to the front face of the middle class by the side of a glass substrate. Moreover, processing with the same said of a quartz substrate was performed, and the reuse was presented.

[0190] In addition, if the glass substrate used as an imprint object is a bigger substrate than a quartz substrate, the imprint to a glass substrate from a quartz substrate like this example can be repeatedly carried out to a superficially different field, and many thin film transistors can be formed on a glass substrate from the number of the thin film transistors which can be formed in a quartz substrate. Furthermore, on a glass substrate, a laminating can be carried out repeatedly and more thin film transistors can be formed similarly.

[0191] (Example 2) a detached core -- H (hydrogen) -- 20at(s)% -- the thin film transistor was imprinted like the example 1 except having considered as the amorphous silicon film to contain.

[0192] In addition, adjustment of the amount of H in the amorphous silicon film was performed by setting up suitably the conditions at the time of membrane formation by the low voltage CVD method.

[0193] (Example 3) The thin film transistor was imprinted like the example 1 except having used the detached core as the ceramic thin film (presentation-bTiO3, thickness: 200nm) formed with the sol-gel method with the spin coat.

[0194] (Example 4) The thin film transistor was imprinted like the example 1 except having used the detached core as the ceramic thin film (presentation: BaTiO3, thickness:400nm) formed by sputtering.

[0195] (Example 5) The thin film transistor was imprinted like the example 1 except having used the detached core as the ceramic thin film (presentation :P b (Zr Ti)O3 (PZT) and thickness: 50nm) formed by the laser-ablation method.

[0196] (Example 6) The thin film transistor was imprinted like the example 1 except having used the detached core as the polyimide film (thickness: 200nm) formed with the spin coat.

[0197] (Example 7) The thin film transistor was imprinted like the example 1 except having used the detached core as the polyphenylene sulfide film (thickness: 200nm) formed with the spin coat.

[0198] (Example 8) The thin film transistor was imprinted like the example 1 except having used the detached core as aluminum layer (thickness: 300nm) formed by sputtering.

[0199] (Example 9) As an exposure light, the thin film transistor was imprinted like the example 2 except having used Kr-F excimer laser (wavelength: 248nm). In addition, the energy density of the irradiated laser was 250 mJ/cm2, and irradiation time was 20ns.

[0200] (Example 10) As an exposure light, the thin film transistor was imprinted like the example 2 except having used Nd-YAIG laser (wavelength: 1068nm). In addition, the energy density of the irradiated laser was 400 mJ/cm2, and irradiation time was 20ns.

[0201] (Example 11) The thin film transistor was imprinted like the example 1 except having considered as the thin film transistor of the polish recon film (80nm of thickness) by elevated-temperature process 1000 degree C as a transferred layer.

[0202] (Example 12) As an imprint object, the thin film transistor was imprinted like the example 1 except having used the transparence substrate made from a polycarbonate (glass transition point: 130 degrees C).

[0203] (Example 13) As an imprint object, the thin film transistor was imprinted like the example 2 except having used the transparence substrate made of an AS resin (glass transition point: 70-90 degrees C).

[0204] (Example 14) As an imprint object, the thin film transistor was imprinted like the example 3 except having used the transparence substrate made from polymethylmethacrylate (glass transition

point: 70-90 degrees C).
[0205] (Example 15) As an imprint object, the thin film transistor was imprinted like the example 5 except having used the transparence substrate made from polyethylene terephthalate (glass transition point: 67 degrees C).
[0206] (Example 16) As an imprint object, the thin film transistor was imprinted like the example 6 except having used the transparence substrate made from high density polyethylene (glass transition point: 77-90 degrees C).
(Example 17) As an imprint object, the thin film transistor was imprinted like the example 9 except having used the transparence substrate made from a polyamide (glass transition point: 145 degrees C).
[0207] (Example 18) As an imprint object, the thin film transistor was imprinted like the example 10 except having used the transparence substrate made of an epoxy resin (glass transition point: 120 degrees C).
[0208] (Example 19) As an imprint object, the thin film transistor was imprinted like the example 11 except having used the transparence substrate made from polymethylmethacrylate (glass transition point: 70-90 degrees C).
[0209] About examples 1-19, when the condition of the imprinted thin film transistor was guessed the ** view under the naked eye and the microscope, respectively, all had neither a defect nor nonuniformity and the imprint was made by homogeneity.
[0210] If the imprint technique of this invention is used as stated above, it will become possible to imprint a thin film (transferred layer) to various imprint objects. or [for example, / that a thin film cannot be formed directly] -- or it can be formed by imprint also to what consisted of an ingredient unsuitable for forming, an ingredient with easy shaping, a cheap ingredient, etc., the large-sized body which is hard to move.
[0211] That in which properties, such as thermal resistance and corrosion resistance, are inferior compared with various synthetic resin or a substrate ingredient like glass material with the low melting point can be used especially for an imprint object. therefore -- for example, it can face manufacturing the liquid crystal display in which the thin film transistor (especially poly-Si TFT) was formed on the transparence substrate, and a large-sized and cheap liquid crystal display can be easily manufactured now as an imprint object as a substrate using the quartz-glass substrate which is excellent in thermal resistance by using a transparence substrate of the ingredient which it is cheap and processing tends to carry out like glass material with low various synthetic resin and melting point. Such an advantage is the same also about manufacture of not only a liquid crystal display but other devices.
[0212] Moreover, although the above advantages are enjoyed, since a transferred layer like a functional thin film can be formed to a heat-resistant high substrate like a reliable substrate, especially a quartz-glass substrate and patterning can be carried out further, a reliable functional thin film can be formed on an imprint object irrespective of the material property of an imprint object.
[0213] Moreover, although such a reliable substrate is expensive, it is also possible to reuse it and, therefore, a manufacturing cost is also reduced.
[0214]

[Translation done.]

JAPANESE [JP,10-125931,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART TECHNICAL PROBLEM MEANS EXAMPLE DESCRIPTION OF DRAWINGS DRAWINGS CORRECTION OR AMENDMENT

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the sectional view showing the 1st process in the gestalt of implementation of the 1st of the imprint approach of the thin film of this invention.
[Drawing 2] It is the sectional view showing the 2nd process in the gestalt of implementation of the 1st of the imprint approach of the thin film of this invention.
[Drawing 3] It is the sectional view showing the 3rd process in the gestalt of implementation of the 1st of the imprint approach of the thin film of this invention.
[Drawing 4] It is the sectional view showing the 4th process in the gestalt of implementation of the 1st of the imprint approach of the thin film of this invention.
[Drawing 5] It is the sectional view showing the 5th process in the gestalt of implementation of the 1st of the imprint approach of the thin film of this invention.
[Drawing 6] It is the sectional view showing the 6th process in the gestalt of implementation of the 1st of the imprint approach of the thin film of this invention.
[Drawing 7] It is drawing showing change of the permeability to the wavelength of the laser light of the 1st substrate (substrate 100 of drawing 1).
[Drawing 8] It is the sectional view showing the 1st process in the gestalt of implementation of the 2nd of the imprint approach of the thin film of this invention.
[Drawing 9] It is the sectional view showing the 2nd process in the gestalt of implementation of the 2nd of the imprint approach of the thin film of this invention.
[Drawing 10] It is the sectional view showing the 3rd process in the gestalt of implementation of the 2nd of the imprint approach of the thin film of this invention.
[Drawing 11] It is the sectional view showing the 4th process in the gestalt of implementation of the 2nd of the imprint approach of the thin film of this invention.
[Drawing 12] It is the sectional view showing the 5th process in the gestalt of implementation of the 2nd of the imprint approach of the thin film of this invention.
[Drawing 13] It is the sectional view showing the 6th process in the gestalt of implementation of the 2nd of the imprint approach of the thin film of this invention.
[Drawing 14] It is the sectional view showing the 7th process in the gestalt of implementation of the 2nd of the imprint approach of the thin film of this invention.
[Drawing 15] It is the sectional view showing the 8th process in the gestalt of implementation of the 2nd of the imprint approach of the thin film of this invention.
[Drawing 16] It is the sectional view showing the 9th process in the gestalt of implementation of the 2nd of the imprint approach of the thin film of this invention.
[Drawing 17] It is the sectional view showing the 10th process in the gestalt of implementation of the 2nd of the imprint approach of the thin film of this invention.
[Drawing 18] It is the sectional view showing the 11th process in the gestalt of implementation of the 2nd of the imprint approach of the thin film of this invention.
[Drawing 19] (a) and (b) are both the perspective views of the microcomputer manufactured using this

invention.
[Drawing 20] It is drawing for explaining the configuration of a liquid crystal display.
[Drawing 21] It is drawing showing the cross-section structure of the important section of a liquid crystal display.
[Drawing 22] It is drawing for explaining the configuration of the important section of a liquid crystal display.
[Drawing 23] It is the sectional view of the device in which the 1st process of the manufacture approach of the active-matrix substrate using this invention is shown.
[Drawing 24] It is the sectional view of the device in which the 2nd process of the manufacture approach of the active-matrix substrate using this invention is shown.
[Drawing 25] It is the sectional view of the device in which the 3rd process of the manufacture approach of the active-matrix substrate using this invention is shown.
[Drawing 26] It is the sectional view of the device in which the 4th process of the manufacture approach of the active-matrix substrate using this invention is shown.
[Drawing 27] It is the sectional view of the device in which the 5th process of the manufacture approach of the active-matrix substrate using this invention is shown.
[Drawing 28] It is drawing of a ****** sake about other examples of the imprint approach of the thin film of this invention.
[Drawing 29] It is drawing of a ****** sake about the example of further others of the imprint approach of the thin film of this invention.
[Drawing 30] It is drawing of a ****** sake about the modification of the imprint approach of the thin film of this invention.
[Description of Notations]
100 Substrate
120 Amorphous Silicon Layer (Laser Absorption Layer)
140 Thin Film Device Layer
160 Glue Line
180 Imprint Object

[Translation done.]

* NOTICES *

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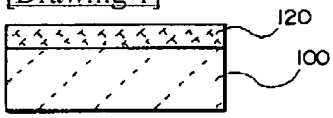
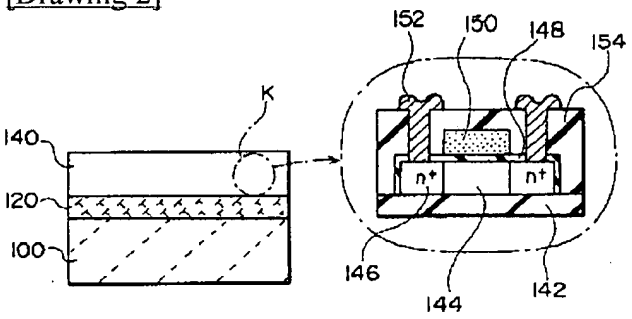
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

[Drawing 1]



[Drawing 2]



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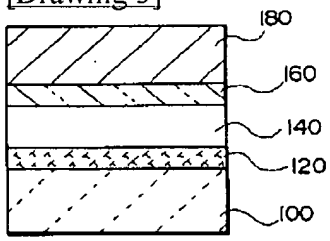

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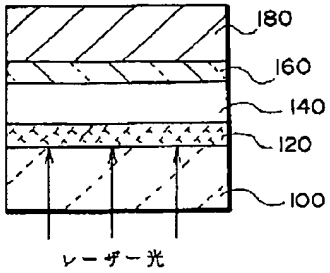

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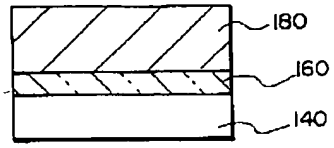

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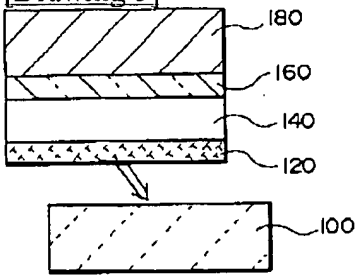

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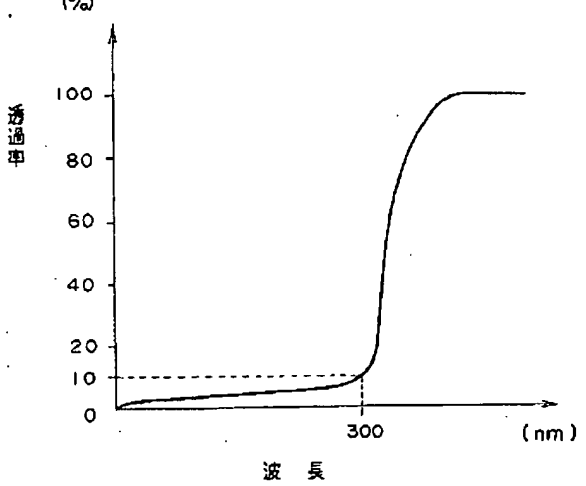

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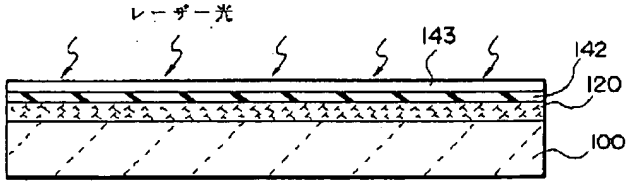
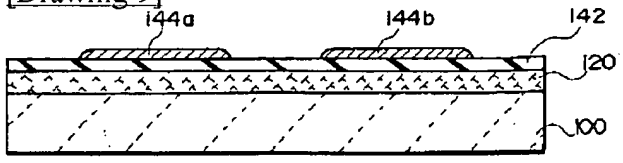


[Drawing 9]



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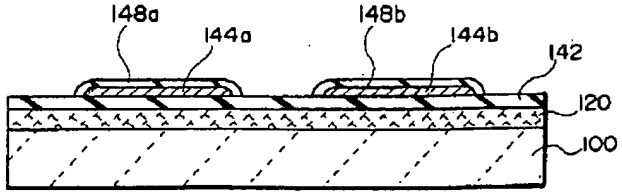

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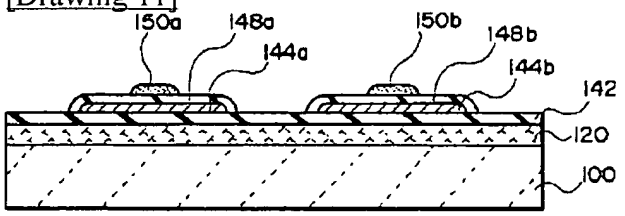

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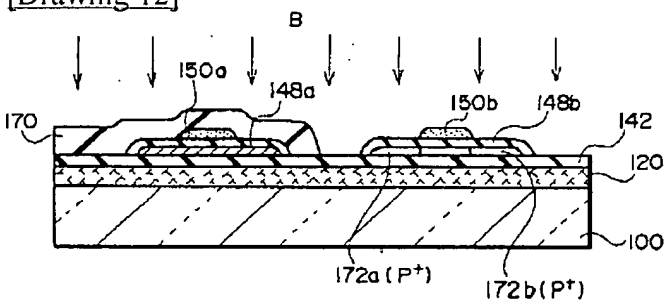

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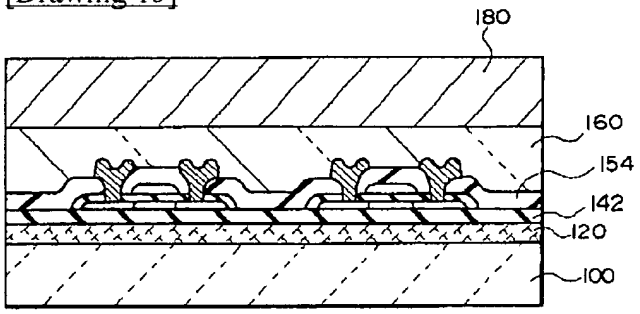

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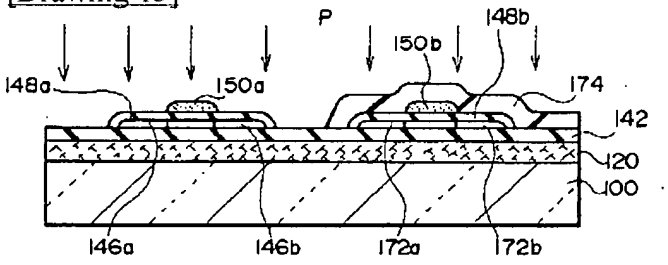

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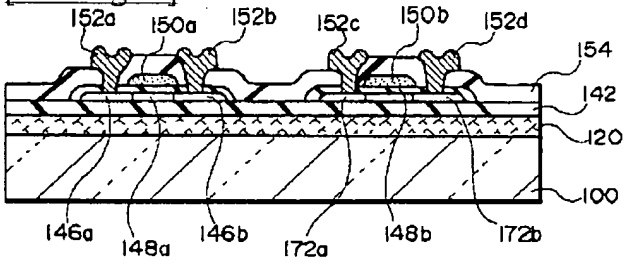

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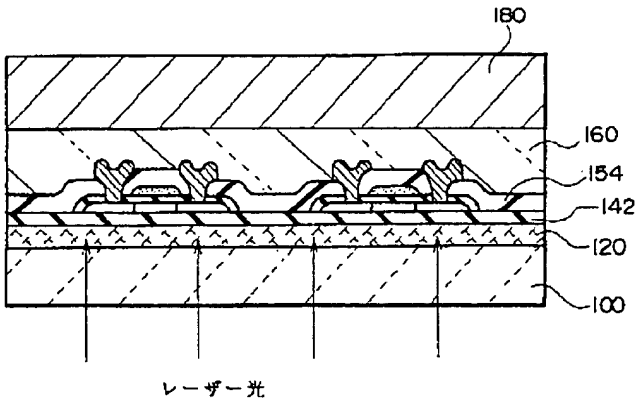

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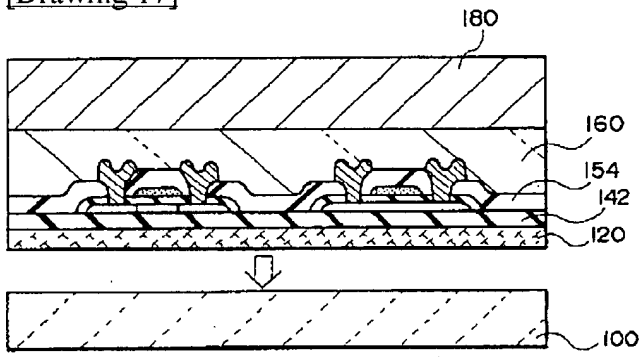

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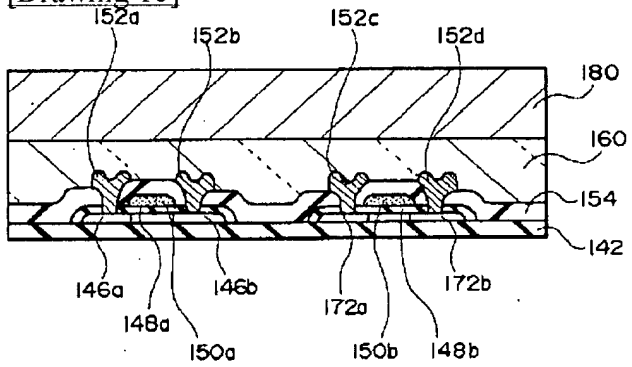

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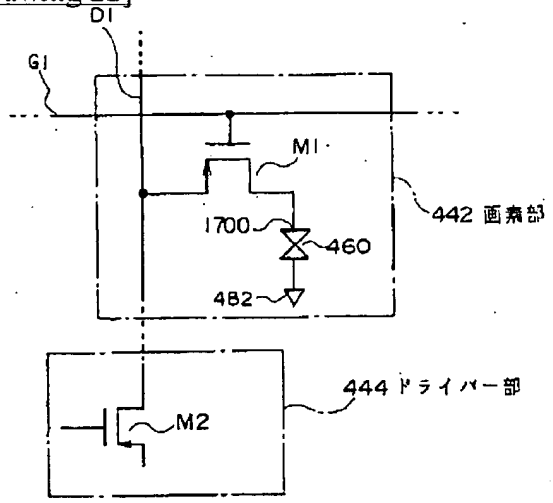

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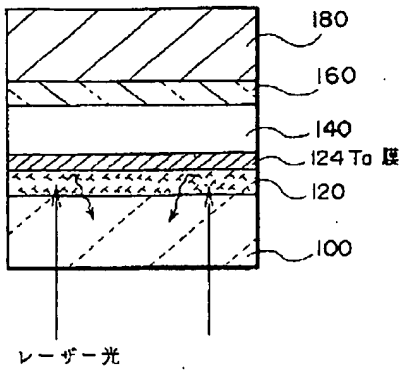

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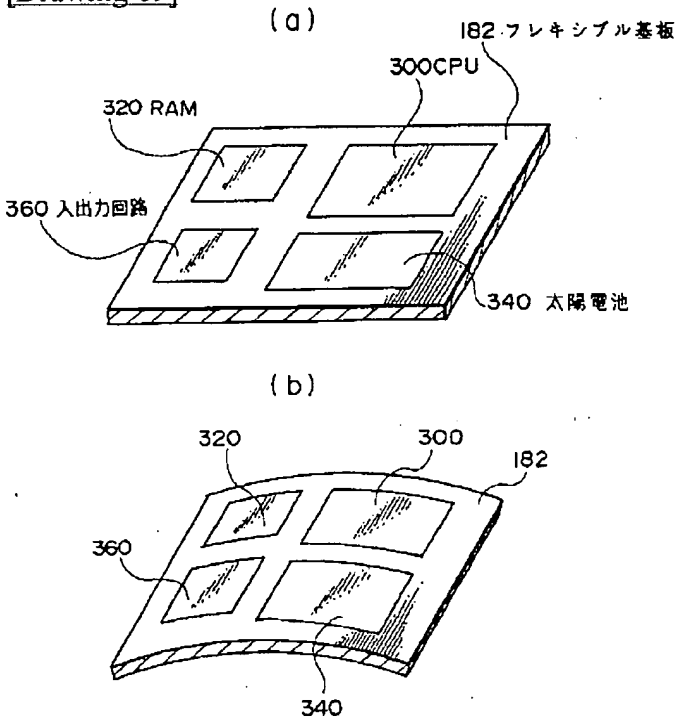

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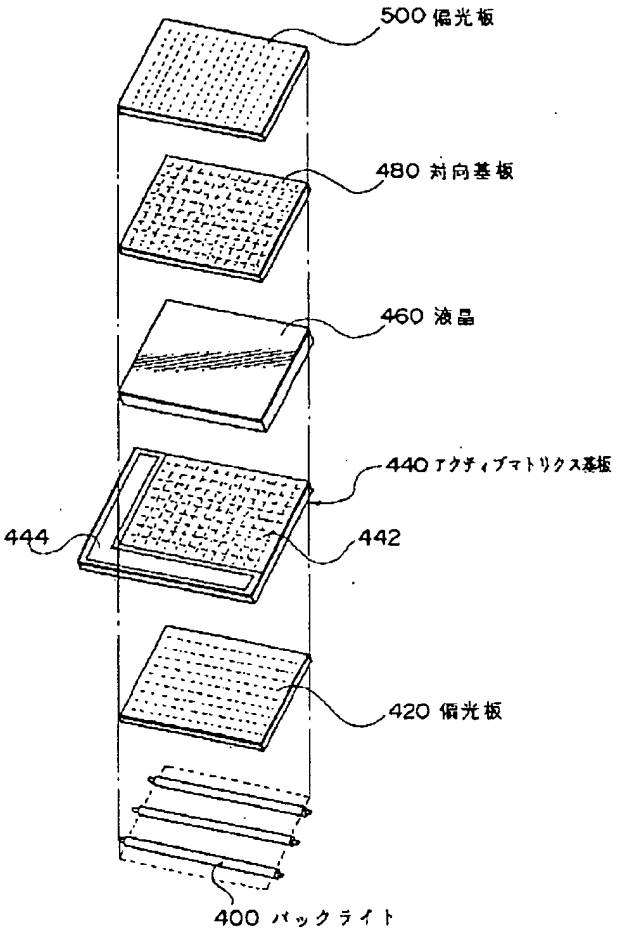

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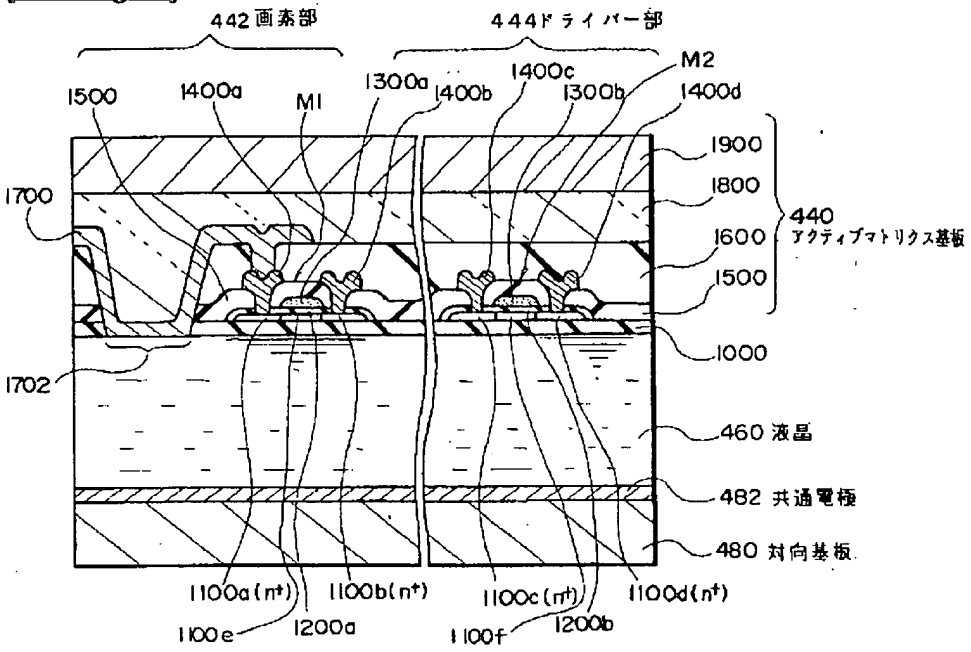

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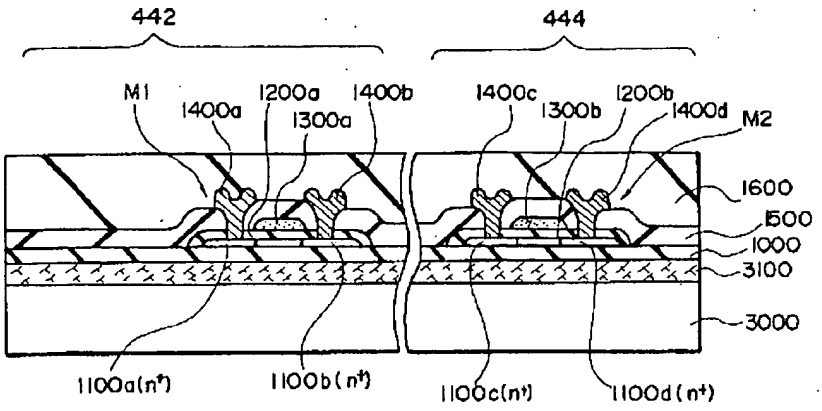

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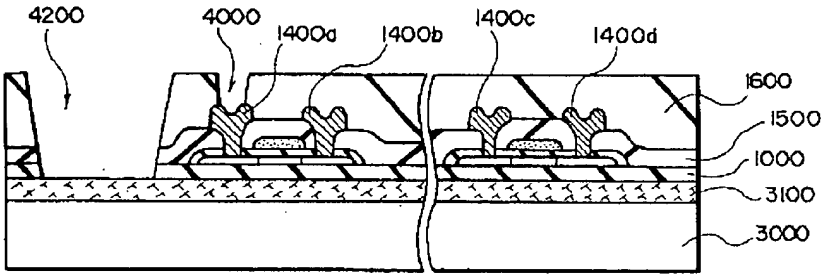

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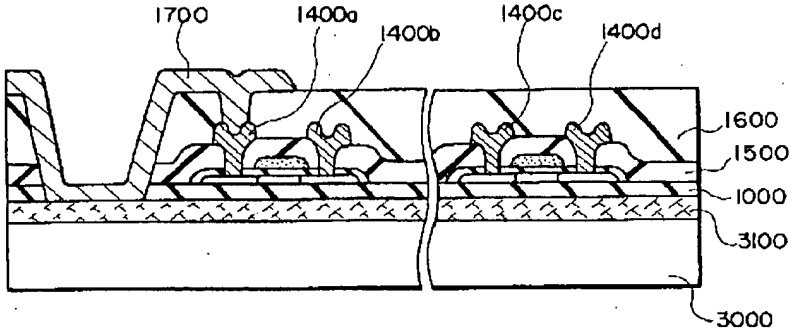

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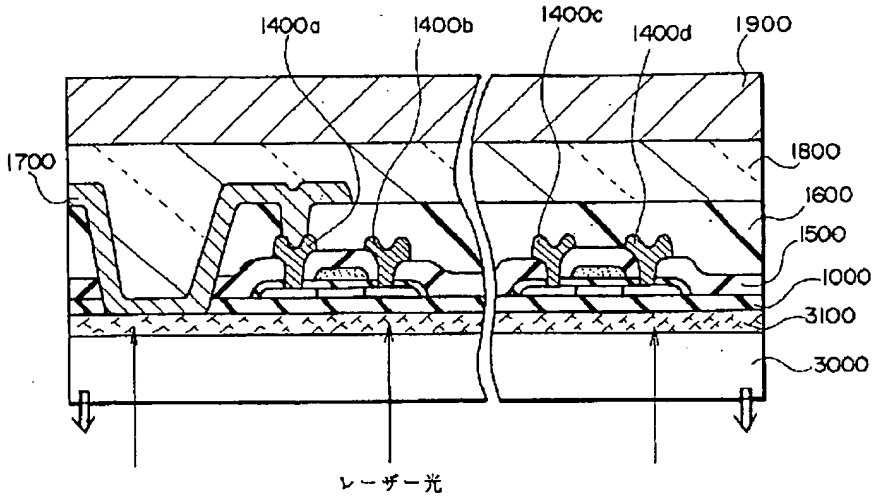

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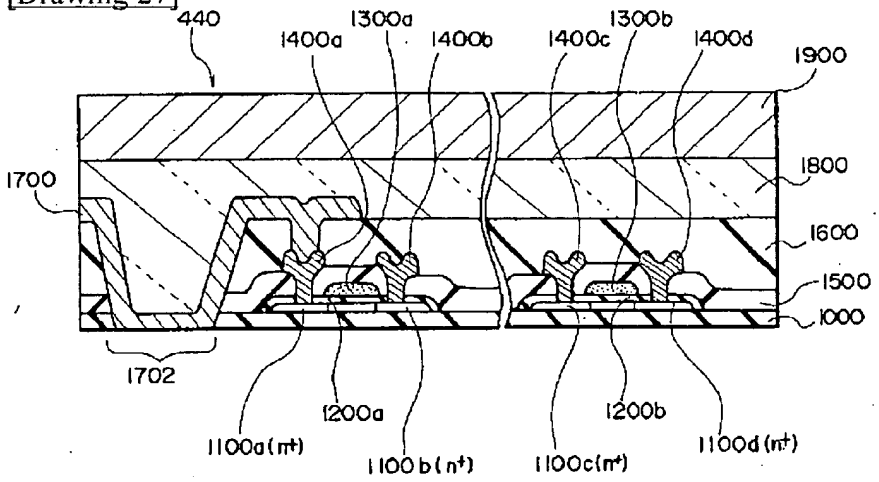

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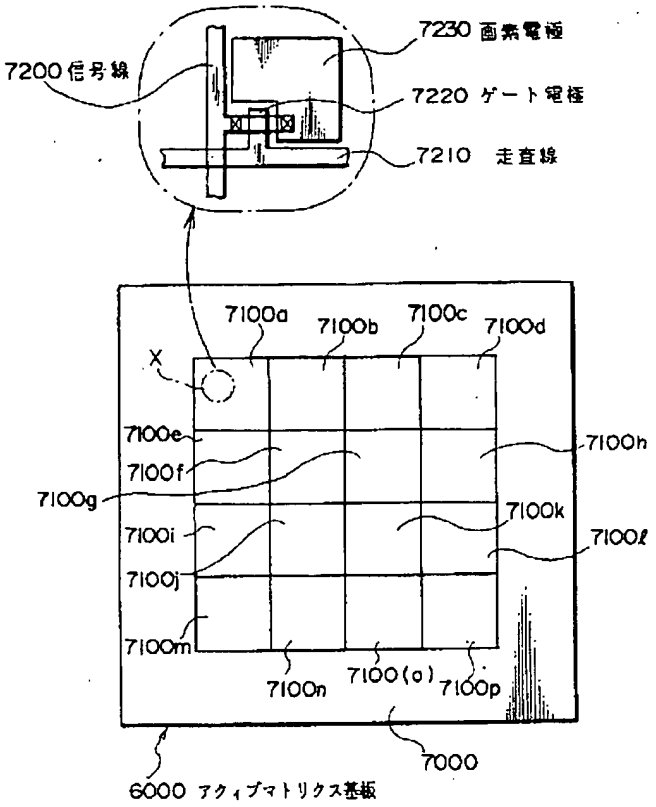

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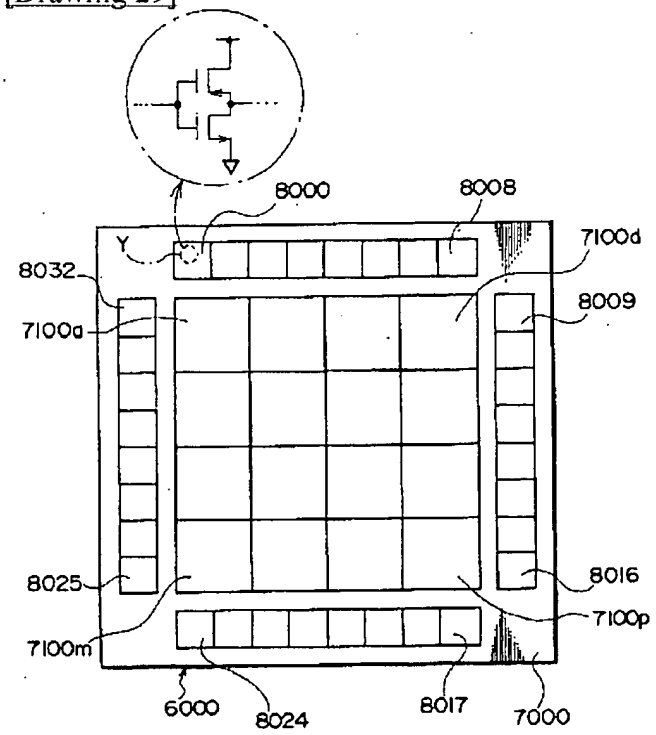

[Translation done.]